

**SOURCE INVENTORY**  
**CATEGORIES # 1287 - 1289**  
**UTILITY EQUIPMENT**  
**RESIDENTIAL AND COMMERCIAL**

**1999 EMISSIONS**

*Introduction*

These categories account for emissions from lawn, garden and other general utility equipment, powered by two and four stroke gasoline engines of less than 20 horsepower and diesel engines. Two-stroke engines have several attributes that are advantageous for applications such as leaf blowers. The two-stroke engines are lightweight and operate in multi-position, allowing for great flexibility in equipment applications. Typical two-stroke engines feed fuel/oil mixture into combustion chamber. A major disadvantage of two-stroke engines is high exhaust emissions. The major pollutants from a two-stroke engines are: oil-base particulates, reactive organics (a mixture of burned and unburned hydrocarbons), and carbon monoxide.

Lawn, garden and other diesel equipment includes products such as walk behind mowers, garden tractors, hedge and lawn trimmers and leaf blowers. General utility equipment includes chain saws, generators, compressors, pumps, welding machines, grinders and shredders.

*Methodologies*

Prior to the 1999 Base year emissions, the methodology for the lawn and garden equipment was based on the published report "Report on Utility Equipment Emissions in the State of California" by Booze, Allen, and Hamilton (BAH). For each type of equipment, estimates were made of the in-use population in California and percentage of use for residential and commercial applications. This was based on national equipment sales data, interviews with domestic and foreign manufacturers. Average HP rating, hourly use and load factor for each type of equipment were estimated for both commercial and residential applications. These were based on data available from engine and equipment manufacturers. Emission factors were obtained from the manufacturers and from tests carried out at South West Research Institute.

In 1998, the California Air Resources Board (CARB) developed the Off-road vehicle emission inventory (OFFROAD) model to estimate emissions from off-road motor vehicles for all counties and air basins in California. The OFFROAD model contains a more comprehensive list of equipment from a wider range of categories compared to

BAH. The OFFROAD model adds an inventory estimate for engines powered by diesel fuel, compressed natural gas (CNG) and liquid petroleum gas (LPG) which were not previously accounted for.

Base Year 1999 emissions for lawn, garden and utility equipment categories in the Bay Area were obtained from the CARB's OFFROAD model.

#### *Monthly Variation*

Monthly variation of emissions was assumed to be mainly in the late spring, summer and early fall. The heaviest usage of utility equipment occurs during weekdays for commercial, and weekends for residential applications. Most of the daily activity occurs during daylight hours.

#### *County Distribution*

County emissions were provided by the CARB's OFFROAD model.

### **TRENDS**

#### *Growth*

Projected emissions for lawn, garden and utility equipment categories were estimated based on ARB's Off-road vehicle emission inventory model. The growth factors utilized in the OFFROAD model are based on a report for the Air Resources Board entitled "A Study to Develop Projected Activity for "Non-Road Mobile" Categories in California, 1970-2020". In this report, certain economic indicators are used to project the growth in population and usage of small off-road engines in various applications. In general, the population of small off-road equipment is expected to increase by approximately 34% between 1990 and the year 2010.

#### *Control*

In December of 1990, the CARB adopted two levels of emission standards for small off-road engines. The first phase of standards (Tier 1) was implemented in 1995 and Tier 2 standards are scheduled for implementation in 1999. The deterioration rates for 4 stroke Tier 1 engines were derived from data supplied by engine manufacturers. Since engines meeting Tier 2 standards are not yet available, engineering judgment was used to estimate the effect of the more stringent standards.

The first set of regulations for utility engines came into effect on January 1, 1994. These were in the form of specific emission standards for different sizes and types of engines used in this type of equipment. More stringent standards came into effect in January 1999.